* A D - 3 2 1 6 *

# AD-3216

## Third Year B. Sc. (Sem. VI) Examination

### March/April – 2015

## Statistical Mechanics & Relativity : Paper - IX

Time : 2 Hours] [Total Marks : 50

**Instructions :**

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
**Fillup strictly the details of ☛ signs on your answer book.**

Name of the Examination :

☛ THIRD YEAR B. Sc. (SEM. VI)

Name of the Subject :

☛ STATISTICAL MECHANICS & RELATIVITY : PAPER - IX

☛ Subject Code No. : 3 2 1 6 ☛ Section No. (1, 2,.....) : Nil

Seat No. :

Student's Signature

(2) All symbols have their usual meanings.

(3) Draw neat diagram wherever necessary.

(4) Figures on the right indicate full marks.

**1** Answer the following in brief : **8**

(1) Give any two examples of boson.

(2) If all the particles of the system are fixed at definite position and not allowed to move, how many states are accessible to the system ?

(3) What do you mean by symmetric wave function ?

(4) What do you mean by an eigen value ?

(5) Give equation of pressure in terms of partition function.

(6) What is a light cone ?

(7) Give the equation of interval between two events ($S_{12}$) in Minkowski's space.

(8) What is principle of covariance ?

**2** (a) Deduce the value of partition function in case of an ideal gas. **10**

**OR**

(a) Obtain the expression for average number of particles for BE statistics. **10**

(b) Derive the equation of entropy in terms of number of microstates accessible to the system. **4**

**OR**

(b) Derive the equation $F = -kT\ lnZ$ **4**

**3** (a) Write a note on space-time diagram. **10**

**OR**

(a) Find the relativistic Hamiltonian for a single particle. **10**

(b) Deduce the four-velocity components in four dimensional Minkowski space. **4**

**OR**

(b) Give the geometrical interpretation of Lorentz transformation. **4**

**4** Attempt any two : **14**

(1) Derive an equation of entropy in terms of partition function and average energy.

(2) State and prove equipartition theorem

(3) Explain how Gibbs paradox is resolved

(4) If $\vec{\nabla} \times \left( \vec{E} + \frac{\partial \vec{A}}{\partial t} \right) = 0$ then prove that $\vec{\nabla} \times \left( \vec{E} + \frac{\partial \vec{A}}{\partial t} \right) = -\vec{\nabla}\varphi$

where $\varphi$ is a scalar field.

---